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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/397,952

09/17/1999

AFTAB AHMAD

MICRON.061DV

9448

20995

7590

02/28/2003

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EXAMINER

RAO, SHRINIVAS H

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 02/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/397,952

Applicant(s)

AHMAD, AFTAB

Examiner

Steven H. Rao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 3--15, 23-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1, 3--15, 23-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Response to Amendment

Applicants' amendment filed on April 01, 2002 has been entered on December 20, 2002. Therefore 1, 3 and 23 as amended by the amendment of July 20, 2001 and claim 15 as recited in the amendment of November 03, 2000 and claims 4 to 14 and 24-28 as originally filed are currently pending in the application.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9 recites the step of, " wherein oxidizing said portion further comprises forming a nitride layer on said conductive layer". It not understood how an oxidizing step can form a nitride layer. It is not clear what applicants' intent to include/exclude by the above recitation. Further, the prior art one knowledge of one skilled in the art does not clarify what applicants' intend to include/exclude. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-15 and 23 -28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ahmad et al. (U.S. Patent No. 5,405,791 hereinafter Ahmad) .previously applied and in view of Arai et al. (U. S. Patent No. 5,972,783 herein after Arai).

With respect to claim 1, Ahmad describes a process of forming a gate structure on a semiconductor substrate including: providing a semiconductor substrate having a channel region formed therein so as to define source and a drain region (Ahmad fig. 5(A), identical to steps shown in applicants' figures 1-2 etc. and described in the specification pages 4 to 6), and a gate structure comprised of a gate dielectric positioned on said channel region and a conductive layer positioned on said gate dielectric (Ahmad fig. 5 (A)).

Ahmad does not specifically describe implanting an insulator element region in to said substrate .

Arai in fig. 1(b), etc. and col. 13 lines 55-64 describes implanting an insulator element region in to said substrate to better control the crystallinity thereby reducing transistor degradation and provide a transistor with better performance and reliability.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Arai's implantation step in Ahmad's process to

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better control the crystallinity thereby reducing transistor degradation to provide a transistor with better performance and reliability. (Arai col. 13 lines 60-64).

The remaining limitations of claim 1 are :

Transforming a portion of said conductive layer adjacent said insulator element region into a sidewall spacer after forming the insulator element region. (Ahmad fig. 2, col. 3 Lines 53-57).

With respect to claim 3, wherein the substrate comprises silicon. (Ahmad col. 3 line 31) .

With respect to claim 4, wherein the insulator element comprises nitrogen (Arai fig.1 b, etc.).

With respect to claim 5, wherein the insulator element region is doped with greater than 10 raised to 12 nitrogen atoms. (Arai col. 12 lines 62-63).

With respect to claim 6, wherein transforming said portion of said conductive layer comprises oxidizing said portion (Ahmad col. 3 line 54).

With respect to claim 8, wherein oxidizing said portion further comprises growing a bird's beak region extending laterally into a selected portion of said conductive layer . (Ahmad fig. 4 # 22 and Arai fig. 1 (b) # 5a).

With respect to claims 9 (to the extent understood) , 10 wherein the oxidizing said portion further comprises forming a nitride layer on the semiconductor substrate and wherein the nitride layer laterally extends under at least a portion of the conductive layer. (Ahmad figure 2 and col. 3 lines 63-64).

With respect to claim 11, wherein the gate dielectric comprises silicon oxide (Ahmad col. 3 line 51).

With respect to claim 12, wherein a second sidewall spacer is deposited over the sidewall spacer. (Ahmad figure 4).

With respect to claim 13, it repeats the steps of claims 1-12 stated above and further adds a protective layer over the source and drain regions, said protective layer comprising said insulator element and characterized by a dielectric constant higher than that of silicon oxide (Ahmad col. 3 lines 64 – silicon nitride layer).

With respect to claim 14, it repeats the steps of claims 8-10 and 13 and is rejected for reasons set out above.

With respect to claim 15 it repeats the steps of claim 1, 6 and 8 and is rejected for reasons set out under claims 1, 4, 6 and 8.

With respect to claim 23, Ahmad and Arai describe a process of eliminating hot electron injection into a gate electrode positioned on a gate oxide adjacent a channel interposed between a source and a drain region in a silicon substrate, the process comprising : forming a nitrogen doped region in said source and drain regions by nitrogen implantation (Arai fig. 19b) etc.) , forming silicon nitride film over a portion of said gate electrode so that a portion of said silicon nitride film penetrates under said gate electrode during said forming step wherein said portion of said silicon nitride film prevents hot electron injection into said gate electrode (Ahmad col. 3 line 56 to col. 4 line 5).

With respect to claim 24, wherein forming the silicon nitride film comprises exposing the gate electrode to an oxidizing ambient (Ahmad col. 4 lines 5-9, ozone atmosphere) .

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With respect to claim 25, wherein the source and drain are implanted using double diffused boron (Ahmad col. 4 lines 33-35).

With respect to claim 26, wherein an insulation layer is deposited over the gat electrode . (Ahmad fig. 3) and an isotropically etching said insulating layer to form sidewall spacers . (Ahmad col. 6 lines 3 to 10).

With respect to claim 27, wherein the source/drain is implanted. (Ahmad fig. 5).

With respect to claim 28, further comprising lightly doping said source and rain regions to grade a junction between said channel and said source and rain regions. (Ahmad figs. 8 to 10, and Arai fig. 2(d),etc.) .

Response to Arguments

Applicant's arguments with respect to claims 1, 3-15 and 23- 28 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (703) 3065945. The examiner can normally be reached on 8.00 to 5.00.

The fax phone numbers for the organization where this application or proceeding is assigned are (703) 7463926 for regular communications and (703) 872-9319 for After Final communications.

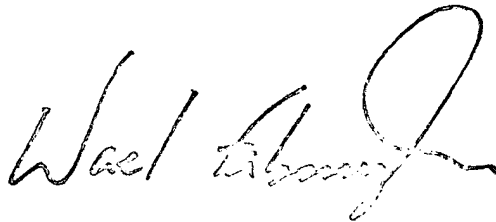
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 3067722.

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Steven H. Rao

Patent Examiner

February 24, 2003.

A handwritten signature in black ink, appearing to read "Wael Abou". The signature is fluid and cursive, with a large loop at the end.

SUPERVISORY PRIMARY EXAMINER
TECHNOLOGY CENTER 2800